- The conclusion that cable companies are much riskier than the two surrogate groups the Commission proposes, the Standard & Poor's 400 Industrials (S&P 400) and telephone companies, is confirmed by our analysis of objective statistics on the relative risk of stocks of cable companies and the two surrogate groups.

- Since unregulated companies in general contain growth options, a DCF estimate of the S&P 400 will tend to underestimate the cost of equity of such a group, all else equal. Therefore, if the Commission determines to start from a DCF estimate of the S&P 400 (a decision we generally would not encourage, given problems with the DCF method in general that we discuss below), it should look to the top of the range of its estimates to find the cost of capital of the S&P 400.

- The Commission's proposal to look to the overall weighted-average cost of capital of its surrogate group should be adopted. The overall cost of capital is not very sensitive to capital structure, as long as the capital structures fall with a broad range of reasonableness. However, the weighted-average cost of capital must be calculated using *market-value* weights, not book-value ones.

- The Commission proposes to use 50-50 debt-equity weights for its calculation. Based on these rates and the greater riskiness of the cable companies than the S&P 400, we calculate that the Commission should add 2 percentage points to its estimate of the overall cost of capital of the S&P 400, to find the overall cost of capital for the typical cable company. (Companies in financial distress may require a higher overall rate of return.)

The remainder of the report consists of two parts. Section II sets forth the principles that govern selection of the allowed rate of return for a cost-of-service regulated company. Section III draws on those principals to evaluate the Commission's proposals in the NPRM.

II. RATE OF RETURN PRINCIPLES

This section addresses three issues: the general merits of cost of capital estimation methods; the conditions under which the allowed rate of return may have to exceed the cost of capital; and the effect of debt on the overall rate of return

A. Cost of Capital Estimation

The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Three key points implied by the definition are:

- Since the cost of capital is an *expected* rate of return, it cannot be directly observed; it must be inferred from available evidence.

- Since the cost of capital is determined *in capital markets* (*e.g.*, the New York Stock Exchange), data from capital markets provide the best evidence from which to infer it.

- Since the cost of capital depends on the return offered by alternative investments *of equivalent risk*, measures of the risks that matter in capital markets are part of the evidence that needs to be examined.

The cost of capital performs three basic functions:

- One is compensation for the pure time value of money: if people are to be induced to forego current consumption in favor of investing money with someone, they need to be paid for the delay. At same time, money that can be invested productively today will produce more a valuable asset tomorrow. People whose money this is want a proportionate share of that value.

- Another function is compensation for expected inflation. If you put $100 aside today, and if you expect it will only buy $95 worth of today's goods when you get the money back, you need compensation not only for the time value of money, but also for the lost $5 of purchasing power. The cost of capital as usually stated includes such compensation.[3] (However, inflation compensation is not always received in cash, the way it is with interest on a savings account — it can also come in the form of expected appreciation in the value of the underlying asset, as with real estate.)

- The third function is compensation for risk. Experience teaches that investors require a higher rate of return when an investment exposes them to risks that are beyond their power to eliminate. The more risk — *e.g.*, the greater the chance the returns the investment actually gives them may differ from the returns they expect — the higher the "risk premium" they demand to supply capital.

Capital markets act to equilibrate the supply and demand for capital of the varying degrees of risk. The cost of capital is the market-clearing price, expressed as a rate of return on investment, for a given risk level. Unfortunately, except for some risk-free assets, the cost of capital cannot be directly observed. We can observe share price volatility, for example, but not the rate of return investors expect when they buy those shares. The problem becomes how to estimate that expected rate of return using quantities that we can observe, such as current interest rates and various statistically-calculated measures of relative risk, or current share prices, dividend yields, and estimates of future growth expectations.

The definition of the cost of capital recognizes a fundamental trade-off between risk and return. The higher the risk, the higher the cost of capital required to compensate for that risk. This leads to what is sometimes called the "Risk Positioning" or "Risk Premium"

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[3] When inflation compensation is included, the cost of capital is known as the "nominal" cost of capital. When it is excluded, the cost of capital is known as the "real" cost of capital.

method to estimate the cost of capital. This method estimates the cost of capital as the sum of a current interest rate and a risk premium, and so reflects the underlying risk-return trade-off. The Commission asked for comments[4] on one Risk Positioning model, the "Capital Asset Pricing Model", and some of the discussion in Section III bears on that request.

However, the Commission preference instead appears to be the other principal market-based method, known as "Discounted Cash Flow," or "DCF". The Discounted Cash Flow or "DCF" approach relies on a simple formula that seems very intuitive:

$$k = D_1/P + g \qquad (1)$$

where "k" is the cost of capital; "D_1" is the dividend cash flow expected at the end of the next period (*e.g.*, the next quarter or year); "P" is the market price of the stock; and g is the *dividend* growth rate that investors expect to be constant *forever*.

However, this version of the DCF approach embodies an assumption that is almost always untrue, and this assumption turns out to matter a lot in practice: the simple DCF formula assumes investors expect dividends will grow at a steady rate forever. If that were literally true, investors would expect everything else to grow at the same steady rate, too: earnings per share, book value per share, etc. All of the various methods of estimating the DCF growth rate — growth rates of dividends, earnings or book value, or the so-called "sustainable growth" approach of return on equity times the earnings retention ratio — would give the same growth rate estimate.[5] Yet anyone who pages through *The Value Line Investment Survey* can readily verify that this is not even approximately true for most

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[4] At page 29 of the NPRM, footnote 55, the Commission states, "We seek comment on the beta and risk premium appropriate for regulated cable service." It also states, "We also seek comments comparing the appropriateness of the DCF and CAPM approaches for setting the cost of equity for regulated cable service."

[5] For completeness, we will note that it may be technically possible that one could find a steady expected dividend growth rate with various other rates varying in the short run in a precisely offsetting way. However, the probability of such a coincidence is on the order of one divided by infinity — *i.e.*, zero.

companies. Growth rate forecasts for different financial measures for the same company often vary by several percentage points, and sometimes by a lot more.

The variance in growth rates implies that the simple DCF model *will* give the wrong answer, no matter what growth rate is selected. It *has* to give the wrong answer, because it depends on a false assumption.

In principle, variants of the simple DCF formula that allow for non-constant growth rates in the near term can do better, and they certainly are superior to the simple model when the simple model is known to be wrong. Nonetheless, even these multiple-growth-rate DCF approaches must ultimately assume a value for a future stock price, which usually is based on a perpetual dividend growth rate, the same assumption that underlies Equation (1).

Moreover, the DCF model only works for companies for which the standard present value formula works. The standard formula clearly does *not* work for options (*e.g.*, puts and calls on common stocks), and so it will not work for companies with valuable growth options. The stocks of companies whose prices include growth options (*e.g.*, the right to make a large, potentially very profitable investment in the future after spending a little money now to learn more about it) will tend to yield DCF estimates that *understate* the actual cost of capital. Similarly, the stocks of firms in financial distress are akin to call options on the firm's assets, with an "exercise price" equal to the firm's outstanding debt. Option-like aspects of stock prices can be a problem if the companies in the sample used to estimate the cost of capital have such features, even if the company whose rate of return is at issue does not.[6] All else equal, this is a problem for the S&P 400 surrogate group, since unregulated companies on average have growth options; therefore, DCF estimates for the S&P 400 will tend to underestimate the S&P 400's cost of capital.

Recently, even the most basic DCF assumption, that the market price of a stock in the absence of growth options is given by the standard present value formula has been called into

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[6] *See* generally, Richard A. Brealey and Stewart C. Myers, 1991, *Principles of Corporate Finance* (4th ed.), New York: McGraw-Hill, Inc., Chapters 20 and 21 for discussion of options and option valuation techniques.

question by a series of articles on market volatility. It is still too early to throw out the standard formula in some applications, if for no other reasons than that the evidence is still controversial and no one has offered a good replacement. But the evidence suggests that it must be viewed with more caution than financial analysts have traditionally. Simple models of stock prices may not be consistent with the available evidence on stock market volatility, and where alternatives exist (as Risk Positioning models provide for cost of capital estimation), they should probably be used.

These questions about the DCF model's strong assumptions — whether the basic present value formula works for stocks, whether investors see important growth options for the company, whether the right variant of the basic formula has been found, and whether the true growth rate expectations have been identified — suggest that the DCF method is *inherently* less reliable than Risk Positioning methods.

B. Allowed Rate of Return vs. the Cost of Capital

The standard goal for cost-of-service regulation is to set regulated rates so investors *expect* to earn the cost of capital. "Expect" is used here in the statistical sense of the term, to imply "expect as the probability-weighted average over all possible outcomes." The underlying economic premise of this approach is that the cost of capital is the return investors could expect in competitive equilibrium. However, the actual legal language is less clear on what should happen when industry in question is a rapidly growing one, rather than one in competitive equilibrium.

Bluefield Waterworks & Improvement Co. v. Public Service Commission 262 U.S. 678 (1923) held that a regulated firm

> is entitled to such rates as will permit it to earn a return on the value of the property which it employs . . . equal to that generally being made . . . on

> investments in other business undertakings which are attended by corresponding risks and uncertainties.[7]

Federal Power Commission v. Hope Natural Gas, 320 U.S. 591, 601-602 (1944) held that equityholders in a rate-regulated firm should find that their return is "commensurate with returns on investments in other enterprises having corresponding risks", and "sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."[8]

The capital attraction standard is met if investors truly expect to earn at least their cost of capital. However, the "corresponding" risks and uncertainties in rapidly growing competitive industries differ from those in competitive equilibrium. There typically is more risk, and there also is an expectation of returns *above* the cost of capital (which is how the market signals competitive firms that rapid growth is warranted). Thus, if the Court's language is read literally, the expected rate of return in this industry should be above the cost of capital, too.

Moreover, if the Commission institutes rules that give cable companies more downside risk than upside opportunity, the allowed rate of return may have to exceed the cost of capital, if investors are to expect to earn the cost of capital on average over all outcomes.[9] The interaction of a historical-cost-based cost-of-service standard with a competitive-price-based standard could create such a situation, for reasons discussed in a companion paper on rate base issues that one of us (Kolbe) and Susan E. Vitka are filing in this proceeding.[10]

For present purposes, however, this paper assumes that the appropriate target under the new cost-of-service regulatory approach will be an expected rate of return equal to the cost of capital, and that the rules the Commission institutes will not be asymmetric.

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[7] *Id.* at 692.

[8] 320 U.S. 591 (1944) at 603.

[9] *See* Kolbe and Tye, 1991 and 1992, and Kolbe, Tye and Myers, 1993, cited in footnote 2.

[10] "Rate Base Issues in Cable Television Cost-of-Service Regulation," filed on behalf of Viacom International, Inc.

C. Effect of Debt on the Overall Cost of Capital

The Commission has also requested comments on how debt affects the rate of return and how to treat debt if it uses a surrogate group to estimate the cost of capital.[11]

Outside the regulated sector, the link between intra-industry differences in capital structure and the prices consumers pay is invisible and probably non-existent. There is no evidence that the majority of unregulated companies seriously pursue "optimal" capital structures or that operating at those capital structures, if they could be found, would confer any significant competitive advantage. Yet capital structure is a hot issue in many regulatory settings.

In our experience, regulators pay capital structure both too much and too little attention. They pay too much attention to the overall financing mix and to financing tactics, and too little to the relationship between financial leverage and the cost of equity capital. A fixed overall cost of capital means that the cost of *equity* and the fair rate of return to equity increase with the debt-to-equity ratio. Therefore, differences in leverage have to be accounted for when estimating equity costs or comparing equity returns.

Rates charged customers depend on the *overall* cost of capital, which does not change materially as capital structure shifts. A company that attempts to lower its overall cost of capital by using more "low-cost" debt will increase the financial risk borne by stockholders and drive up the cost of equity.

This is not just theory. It is consistent with how unregulated companies actually behave. There is no evidence that companies which "lever up" gain any material competitive advantage. In fact it is the other way around: weak players generally end up with high debt ratios. Managers may give lip service to target debt ratios, as if there were a discernable optimum, but they tolerate extended excursions from those targets. There is no reason

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[11] *Notice of Proposed Rulemaking*, MM Docket No. 93-215, paragraph 49 and footnote 51.

regulators should not be equally relaxed about debt ratios, provided they are in a reasonable range, and focus their efforts elsewhere.

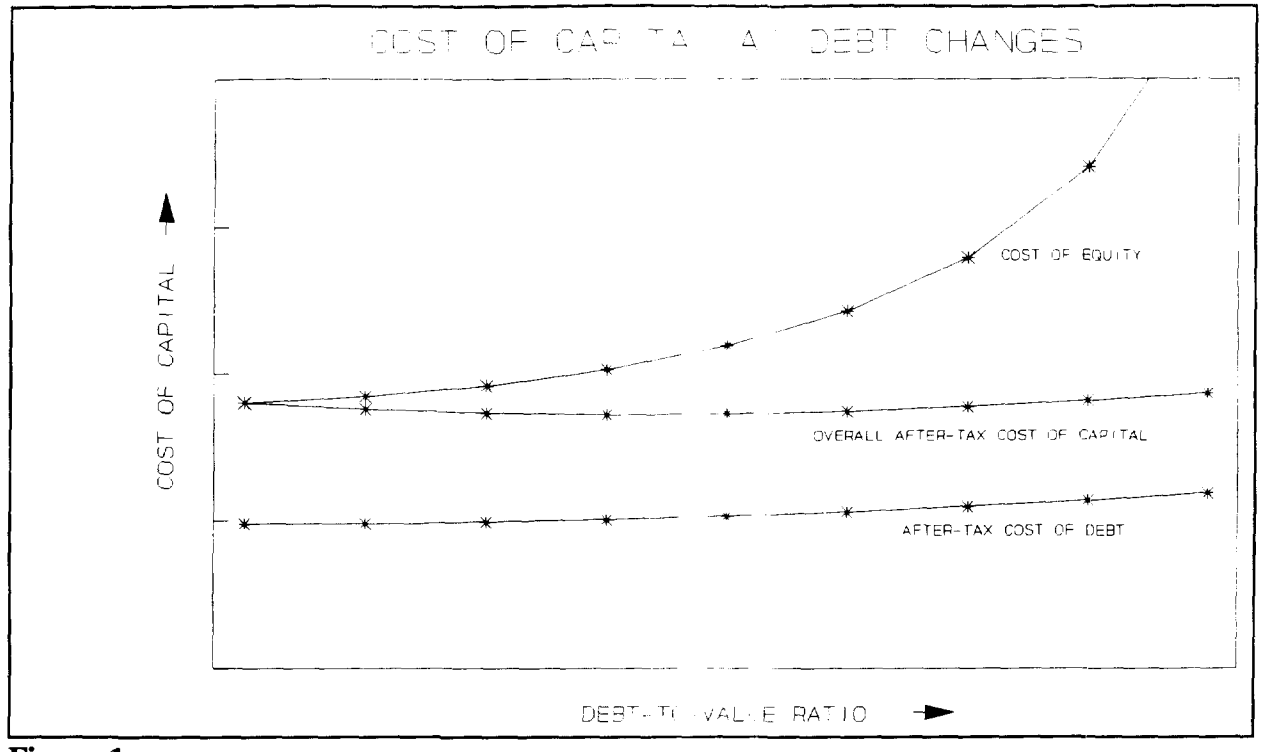

Figure 1

The reason capital structure is unimportant, if properly analyzed, is illustrated in Figure 1. The overall after-tax cost of capital (*i.e.*, the weighted average of the cost of equity and the *after-tax* cost of debt) declines initially as debt is added, because the fact that interest payments are deductible at the corporate level is valuable to the firm. However, the corporate tax advantage on debt is offset to a degree by a personal tax disadvantage to debt. Moreover, too much debt can lead to financial distress. Thus, the overall after-tax cost of capital and the cost of debt both eventually begin to climb as debt is added.

The net effect is that the *overall* after-tax cost of capital is not very sensitive to the debt ratio.[12] As noted above, this conclusion is reinforced by actual corporate behavior. Capital structures vary widely among unregulated firms in the same industry, and often the most profitable (and hence presumably best-managed) firms have the least debt. If the overall after-tax cost of capital declined markedly as debt was added, one would expect to see exactly the reverse.

The cost of equity is sensitive to the debt ratio, however. Debt adds risk for equityholders at an ever increasing rate. The reason is that equityholders must bear the bulk of the uncertainty in the firm's operating earnings (because debt payments are fixed and, absent severe financial distress, are made before equityholders get any money) with an ever-shrinking share of the total capital of the firm. For example, if *operating* earnings change by plus or minus 10 percent of total capital, *equity* earnings also change by plus or minus 10 percent with 100 percent equity. However, equity earnings would change more with less equity: by plus or minus 20 percent with 50 percent equity, by plus or minus 40 percent with 25 percent equity, and by plus or minus 100 percent with 10 percent equity. The result is the exponentially growing cost of equity curve in Figure 3.

What this means for cable regulation is that if the Commission: (1) finds a surrogate group of comparable overall risk; and (2) matches the costs debt and equity for the surrogate group with the *market-value*[13] shares of debt and equity of the group; then (3) it will calculate an

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[12] The precise shape of the overall cost of capital line in Figure 1 is unknown. Thus, it may be less symmetrical, staying flat or even declining slightly over broad middle range and only turning up sharply further to the right than depicted. Also, the shape may vary somewhat from industry to industry. However, the basic point that capital structure does not matter much except at the extremes remains unaffected by the precise shape.

[13] The cost of equity capital depends on the relative market values of debt and equity for a given level of overall risk. Therefore, when calculating the after-tax weighted-average cost of capital it is necessary to use market-value weights. Otherwise the final estimate will be wrong, especially for unregulated companies where historical book costs are so lacking in meaning (a point covered more extensively in the companion report by Kolbe and Vitka, referenced in footnote 10.

overall rate of return that is essentially the same as it would get at a different capital structure.[14]

III. IMPLEMENTATION OF THE PRINCIPLES

The Commission has to come up with a rate-of-return standard as part of its cost-of-service test. The NPRM asks for comments about use of two possible surrogate groups, the Standard & Poor's 400 and regulated telephone companies.[15] This paper provides such comments below. First, however, it addresses a more basic question: why are surrogate groups even being contemplated?

A. Implications of the Need for a Surrogate Group

It is common practice to estimate the cost of capital for rate-regulated companies using market data for companies in that *same* regulated industry. Therefore, it is natural to ask why the Commission proposed surrogate groups other than the cable industry itself (*i.e.*, the S&P 400 and telephone companies) as the basis of a cost of capital analysis of the cable industry.

We do not find a clear answer in the NPRM, but there is reference to an issue that almost certainly is at least part of the explanation: the Commission asks for comments on the meaning of analysts' long-run growth expectations for companies with no current dividend.[16] In fact, we have identified a sample of eight publicly traded corporations that

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[14] If the Commission cannot find a comparable-risk surrogate group for which it can estimate the cost of capital, it should adjust appropriately the overall return of the surrogate group it does use. We return to this topic below.

[15] NPRM, paragraph 50.

[16] At footnote 54 of the NPRM, the Commission states, "Parties proposing surrogates with no current dividends should pay particular attention to the stability and range of long term analyst estimates."

derive a large percentage of their revenues from cable television service, and six of the eight have no cash dividend.[17] Four of the eight had *negative* book net worth as of 1992. The companies in question are listed in Table 1, which shows the share of their 1992 revenues derived from cable operations, their current dividends, and their 1992 net worth.

There is important information in these facts for the benchmark group and cost-of-capital estimation method that the Commission ultimately decides to use. Low/no dividend companies tend to be high-growth companies, where money is worth more in new investments than in the hands of shareholders.[18] Low/no dividend companies also tend to be high-risk companies, with uncertain cash flows that generate a need to hold onto cash. Such companies also have many more growth options than more stable companies.[19]

In short, the very reason that the Commission needs to look to a surrogate group if it wants to use the DCF model implies that (1) cable television is a very risky industry, riskier than surrogate groups for which DCF numbers can be calculated; and (2) the DCF model, even if it could somehow be used directly with the cable companies, would tend to *underestimate* the cost of capital for that industry. The Commission needs to accommodate these facts when it decides on a rate of return for cable operators.

B. Quantitative Analysis

We have analyzed objective statistical measures of relative risk for *Standard & Poor's* 400 Industrials, a sample of publicly traded cable companies and a sample of publicly traded

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[17] These represent all publicly traded cable television corporations we could find with cable revenues of at least 65 percent of total revenues.

[18] The Kolbe-Vitka companion paper on rate base issues, referenced in footnote 10, discusses additional implications of the growth of this industry.

[19] As noted in the previous section, the DCF approach will tend to *under*estimate the cost of capital for companies with valuable growth options, because of the way the option-pricing formula differs from the present value formula that the DCF model assumes is valid.

telephone companies. The paper first describes the samples, followed by a discussion of the measure of relative risk used. Finally, it presents the results.

1. The Sample

The overall cost of capital for a company or a division of a company depends on the risk of the business in which the entity is engaged. The objective in these proceedings is to determine the cost of capital for the cable television business and hence to assess the risk of the cable television business. Thus, the ideal sample is a number of companies that are publicly traded "pure plays" in the cable television business. ("Pure Play" is a Wall Street term for a company that engages in a single line of business.) Publicly traded firms are required because the best way to infer the cost of capital is to examine evidence from capital markets on companies in the given line of business.

Such a sample exists in the cable television business. We identified a large set of publicly traded cable corporations. These corporations were either listed in the *Value Line Investment Survey* or identified as key cable stocks in the February 12, 1993 edition of "Cable television Investor Data Roundup" published by Paul Kagan Associates, Inc. Data on revenue from cable system operations was collected for this sample either from annual reports or via phone calls to the company. All companies with revenue from cable systems less than 60 percent were eliminated from the sample. In most cases revenues from cable service are well in excess of 80%. A list of the companies and their cable television revenue is found in Table 1.

We also examined companies in the telephone exchange business. These include the Regional Bell Operating Companies (RBOCs)[20] and two large independents, GTE and Southern New England Telecommunications. These companies derive substantial portions of their revenues from local exchange/toll services.

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[20] The seven RBOCs are Ameritech, Bell Atlantic, Bell South, NYNEX, Pacific Telesis, Southwestern Bell, and US West.

TABLE 1

THE SAMPLE OF PUBLICLY-TRADED CABLE SERVICE COMPANIES

	Cable Service Revenue (as a % of Total 1992 Revenue)	*Dividends*	*1992 Net Worth ($000s)*
Adelphia Communications Corporation	95.0%	None	-868,614
Cablevision Systems Corporation	95.0%	None	-1,250,248
Century Communications Corporation	90.0%	5% Stock	-178,342
Comcast Corporation	80.9%	$0.035 Cash Paid in June 1993	-181,641
Jones Intercable, Inc.	67.0%	None	26,875
Jones Spacelink, Inc.	67.0%	None	8,998
TCA Cable TV, Inc.	99.0%	$0.100 Cash Paid in July 1993	77,957
Tele-Communications, Inc.	99.0%	Last dividend paid in February 1991	1,486,000

2. Relative Risk

To measure the relative risk of a company, we calculate the "beta" of the stock in question. Beta is a measure of the "systematic" risk of a stock — the extent to which returns on that stock are correlated with returns on other stocks. The basic idea behind beta is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification.[21]

An analogy may be helpful. An individual playing roulette can win or lose a fortune. The owners of the roulette wheel bear little risk from roulette, however. Over time, the losses on one night are more than balanced by the gains on other nights. And if there are many wheels in the casino, diversification's elimination of the casino's exposure to the risks of roulette proceeds that much faster. However, that does not mean gambling casinos are risk-free for the owners. The casino owners' risk comes not from roulette but from the state of the economy. They do well when people feel rich and come to gamble, while in recessions they do poorly as people stay at home or gamble less when they do come. Beta is a measure of the second kind of risk, that caused by market-wide factors that cannot be eliminated through diversification.

Nor can an undiversified investor expect compensation for the additional risk he or she might bear. For example, suppose an investor bet everything on one stock. That investor could be exposed to enormous risk, far more than an investor who put the same amount of money in a well diversified portfolio of many stocks. Yet there is only one price for a given stock. If that price were especially low, so as to offer a premium rate of return for an undiversified investor, diversified investors would see it as a bargain and snap it up. Their buying would drive up the price until it offered no premium for risk exposure that well diversified investors can eliminate.

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[21] Beta is the risk measure that underlies the Capital Asset Pricing Model. However, beta is a general risk measure, while the CAPM is only one particular model of how risk relates to return. Thus, one could accept beta as a risk measure without necessarily accepting the CAPM as the way risk and required returns are related.

While a substantial amount of risk can be eliminated through diversification, the amount of risk that still remains is also substantial. Many factors that make a particular stock go up or down also affect other stocks. Examples include the state of the economy, the balance of trade, and inflation. Thus some risk is "non-diversifiable" or "systematic." This is what beta measures.

By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk. It goes up or down by 10 percent on average when the market goes up or down by 10 percent. Stocks with betas above 1.0 exaggerate the swings in the market. Stocks with betas of 2.0 tend to fall 20 percent when the market falls 10 percent, for example. Stocks with betas below 1.0 are less volatile than the market. A stock with a beta of 0.5 will tend to rise 5 percent when the market rises 10 percent.

The usual approach to calculate beta is a statistical comparison of the sensitivity of a stock's (or a portfolio's) return to the market's return. Many investment services report betas, including Merrill Lynch's quarterly *Security Risk Evaluation* and the *Value Line Investment Survey*. Here we calculate betas by statistical regression of the excess (positive or negative) of the return on the stock over the risk-free rate on the excess of the return on the Standard & Poor's 500 stock index over the risk-free rate.

It should be noted that the degree to which beta is correlated with required rates of return is now a subject of some controversy. A series of papers by Professors Eugene Fama and Kenneth French have suggested that other risk measures may be more valuable than beta. Their work has been challenged by others, as has the popular interpretation of their work that beta does not matter at all. (In fact, the most useful empirical Fama-French model of the cost of equity uses beta in the traditional way, but supplements it with other measures of relative risk.) At present, the work in this area implies considerable dispute about the question of just what Risk Positioning model best describes the way the cost of capital is set. However, the use of beta as *one* key measure of relative risk remains a sound practice.

3. Results

The equity betas for the cable company sample and the S&P 400 Industrials are shown in Table 2. The results show that the equity beta for the cable companies is considerably greater than 1.0. The simple average of 1993 equity beta values is 1.74, and the industry has been becoming *more* risky with time. The equity beta for the S&P 400 industrials is consistently close to 1.0.

The equity betas for the sample of telephone companies is shown in Table 3. These values average in the 0.6 to 0.8 range, depending on the year, materially below the S&P 400 and even further below the cable industry.

These data suggest that cable stocks are considerably riskier than the S&P 400 or the telephone companies. This finding reinforces the conclusion derived above, based on the impossibility of implementing a DCF model for the cable industry at present. Thus, the surrogate groups the Commission has proposed *understate* the relative risk of cable companies' equity by a material amount.

One issue is yet to be addressed, however: capital structure. The low book net worth of the cable companies might be matched by low market values of equity, relative to their outstanding debt.[22] If the cable companies had enough extra debt relative to the other groups, it is possible that their overall after-tax costs of capital would be the same.

We address this issue in three steps:

- Calculate the overall risk (*i.e.*, of debt and equity combined) of the cable companies;

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[22] However, it would not be unusual for the reverse to be true. High-growth companies very often have much higher market equity ratios than book equity ratios.

Table 2
Equity Betas for Sample of Publicly-Traded Cable Companies and the S&P 400 Industrials

	Estimated Betas: End-of-year						
Equity Issue	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**
Adelphia Communications Corp.	—	—	—	—	1.60	1.79	1.98
Cablevision Systems Corp.	—	—	—	—	1.53	1.74	1.86
Century Communications Corp.	—	—	—	—	1.90	2.07	2.24
Comcast Corp. (Class A)	0.96	1.04	1.05	1.23	1.19	1.47	1.56
Comcast Corp. (Special)	—	—	—	—	1.25	1.58	1.64
Jones Intercable, Inc.	1.38	1.42	1.51	1.39	1.27	1.36	1.48
Jones Intercable, Inc. (Class A)	1.72	1.83	1.74	1.64	1.56	1.81	1.93
Jones Spacelink, Inc.	1.53	1.46	2.09	2.29	2.17	2.46	2.41
TCA Cable TV, Inc.	0.84	0.86	0.86	0.97	0.84	0.86	0.90
Tele-Communications, Inc. (Class A)	1.24	1.34	1.31	1.48	1.40	1.63	1.74
Tele-Communications, Inc. (Class B)	1.05	1.14	1.14	1.32	1.21	1.27	1.35
Average Cable TV	1.25	1.30	1.39	1.47	1.45	1.64	1.74
S&P 400 Industrials	1.04	1.04	1.04	1.03	1.04	0.99	1.00

Source: The Brattle Group. Equity betas are calculated by regressing stock returns less returns on 30-day Treasury Bills on the S&P 500 returns less returns on 30-day Treasury Bills for the 60 months prior to and including December of year t; and 60 months prior to and including June for 1993. Data was not available to calculate betas in some years.

Table 3
Equity Betas for Telecommunications Companies

Company	Estimated Betas: End-of-year				
	1988	1989	1990	1991	1992
RBOCs					
Ameritech	0.54	0.64	0.66	0.57	0.75
Bell Atlantic Corporation	0.54	0.63	0.67	0.61	0.79
Bell South Corporation	0.70	0.78	0.75	0.62	0.82
NYNEX Corporation	0.66	0.70	0.72	0.61	0.77
Pacific Telesis Group	0.63	0.72	0.67	0.61	0.80
Southwestern Bell Corporation	0.62	0.70	0.74	0.67	0.91
US West, Inc.	0.68	0.75	0.73	0.65	0.78
Other Telecommunications Companies					
GTE Corporation	0.71	0.69	0.71	0.65	0.86
Southern New England Telecommunications (SNET)	0.51	0.53	0.62	0.58	0.73
Average	0.62	0.68	0.70	0.62	0.80

Source: The Brattle Group. Equity betas are calculated by regressing stock returns less returns on 30-day Treasury Bills on the S&P 500 returns less returns on 30-day Treasury Bills for the 60 months prior to and including December of year to t; and 60 months prior to and including June 1993. Data were not always available to calculate betas in some years.

- Calculate the risk the cable companies' equity would have if their capital structure were the same as the S&P 400's and if their debt were of the same risk as the S&P 400's; and

- Calculate the implied risk premium increment to the overall S&P 400 cost of capital that would be necessary of offer adequate compensation for this degree of risk.

The details are contained in Appendix B. The highlights of our procedure are:

- We use the Commission's proposed debt-to-value ratio of 50 percent for the S&P 400;[23]

- We recognize the greater risk of cable debt than S&P 400 debt in calculating the overall returns to cable and the risk cable equityholders would bear if their debt were as safe as the S&P 400 debt rates used in the Commission's proposed calculation;

- We use the Capital Asset Pricing Model (CAPM) with a market risk premium of 8.5 percent to calculate the incremental overall risk premium required for cable companies.

Our answer is that a two percentage point incremental risk premium over the S&P 400 overall cost of capital is required for cable companies.[24] Table 4 shows the equity betas the cable companies would have at the S&P 400 capital structure and debt cost. It also reports the overall incremental risk premium by year.

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[23] NPRM, paragraph 52.

[24] A higher incremental risk premium will be required for cable companies in financial distress.

Table 4
Relevered Equity Betas of Cable Service Companies

	Estimated Betas: End-of-year						
Equity Issue	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**
Adelphia Communications Corp.	—	—	—	—	1.06	1.08	1.12
Cablevision Systems Corp.	—	—	—	—	1.26	1.32	1.38
Century Communications Corp.	—	—	—	—	2.11	2.09	2.23
Comcast Corp. (Class A)	1.49	1.40	1.34	1.46	1.41	1.57	1.65
Comcast Corp. (Special)	—	—	—	—	1.46	1.67	1.72
Jones Intercable, Inc.	1.51	1.58	1.62	1.34	1.26	1.30	1.39
Jones Intercable, Inc. (Class A)	1.81	1.96	1.82	1.50	1.45	1.60	1.68
Jones Spacelink, Inc.	1.53	1.45	1.76	1.48	1.39	1.41	1.39
TCA Cable TV, Inc.	1.31	1.37	1.30	1.42	1.23	1.25	1.31
Tele-Communications, Inc. (Class A)	1.35	1.44	1.43	1.52	1.46	1.67	1.76
Tele-Communications, Inc. (Class B)	1.19	1.28	1.29	1.40	1.31	1.37	1.44
Average Cable TV	1.46	1.50	1.51	1.45	1.40	1.48	1.55
Incremental Risk Premium	1.8%	1.9%	2.0%	1.8%	1.6%	2.1%	2.4%

Source: The Brattle Group.

The third of the technical procedures summarized above may require some additional discussion, regarding both the use of the CAPM and the use of a market risk premium of 8.5 percent. We take the second point first.

The Market Risk Premium. The "market risk premium" in the CAPM and in other models of the cost of capital is the excess of the expected rate of return on an average-risk portfolio over the short-term risk-free interest rate. There is considerable evidence to suggest that 8.5 percent is a good estimate of the market risk premium.

The best evidence on the premium that investors require to bear risk today is the average premium in the rates of return they have actually earned over long periods. This is because stock returns are extremely volatile. One implication is that scholarly attempts to use historical data to identify changes in the market risk premium have generally not succeeded. There is some weak evidence that the market risk premium is higher than average when the stock market is more volatile than average, but the evidence is also consistent with the view that the market risk premium never changes at all. Moreover, there is no reliable way to quantify just how much the market risk premium might differ from the average value at any given time. As a result, the long-run realized risk premium is the best estimate of the risk premium investors expect today.

Having said this, we should also note that the U.S. market has been more volatile in recent years than the average of the post-War period. If one were to try to "fine-tune" the market risk premium for relative volatility, that would tend to imply an above-average risk premium at present. Thus, use of the average historical value for the market risk premium will tend to *understate*, if anything, the market risk premium investors expect today.

Additionally, a recent study provides new evidence on this topic, evidence based on the DCF approach applied to the market as a whole. Specifically, Professors Robert S. Harris and Felicia C. Marston have recently studied the market risk premium over the period 1982 to 1991 ("Estimating Shareholder Risk Premia Using Analysts' Growth Forecasts," *Financial Management* (Summer 1992): 63-70). They find that the average expected risk premium of stocks over government *bond* yields was 6.47 percent. The average maturity premium

of government bond yields over one-month Treasury *bills* over 1982-1991 was 1.73 percent. The sum of these, 8.20 percent, can be compared to the 8.5 percent risk premium of stocks over bills that we use. However, it is a downward-biased estimate of the true risk premium of stocks over bills, for two reasons.

First, Professors Harris and Marston cannot apply their approach to stocks that pay no dividends, but no-dividend stocks tend to be riskier than average. Therefore, their sample omits a class of companies that would tend to pull their average risk premium up. Second, as discussed above, the stock price of companies that have valuable growth options will be higher than the DCF model assumes, so the DCF costs of capital derived from such stock prices will underestimate the stocks' true costs of capital. The market as a whole will include a good many such companies.

These two factors imply that the Harris-Marston paper supports our conclusion that 8.5 percent is a reasonable estimate for today's market risk premium.

Use of the CAPM. Our actual calculations are based on the CAPM. However, we believe our finding of a two percentage point incremental risk premium over the overall S&P 400 cost of capital is reasonable, and even conservative, for this industry regardless of the "true" model that underlies the cost of capital.

The CAPM is the most basic, and for unregulated companies the most widely used, of the modern models of the cost of capital. It has long been known that high-beta stocks tend to have somewhat lower costs of capital than predicted by the CAPM. The Fama-French challenge referenced above is just one of a number of attempts to develop a better model.

However, it has also long been known that small-company stocks have higher costs of capital than predicted by the CAPM as well, and the Fama-French results are in part just further support for this finding. Many of the cable companies the Commission is about to regulate are very small by regulated company standards, and any benchmark rate of return must take this into account. Additionally, this is an industry expected to require substantial new investments in equipment that is expected to offer customers a variety of new and valuable

services. The cost of underestimating the required rate of return could be a delay in the introduction of such service improvements, a cost that must be weighed as much as the cost of the payments made for existing services.

In these circumstances, the precise model used to estimate the incremental risk premium is less important than the reasonableness of the end result. Given the above risk data, the simple and significant fact that DCF estimates cannot be calculated for this industry yet can be for the S&P 400, and the current nature of the industry, an overall benchmark rate of return of two percentage points above that of the S&P 400 seems the very least that might reasonably be granted.

IV. CONCLUSION

The Commission must set a rate of return for an industry where the most widely used approach in rate regulation, the DCF model, *cannot* be applied. That fact speaks volumes about the risk of the industry about to be regulated. In particular, such an industry is almost certainly riskier than a surrogate group for which the DCF model *can* be applied. That this is in fact true for the cable industry is confirmed by their high (and increasing) beta risk statistics. This industry's risk is well above that of the S&P 400, and *a fortiori* above that of telephone companies.

If the Commission decides to keep the S&P 400 as a surrogate group, it should grant cable companies an incremental overall risk premium of at least two percentage points above the S&P 400's overall rate of return. Furthermore, if the Commission decides to use the DCF model with the S&P 400, it should pick a value near the top of the observed range, because the DCF model will tend to underestimate the cost of capital for unregulated companies.

APPENDIX A

QUALIFICATIONS OF A. LAWRENCE KOLBE

Lawrence Kolbe is a Principal of The Brattle Group, an economic, management and environmental consulting firm located in Cambridge, Massachusetts. Before co-founding The Brattle Group, he was a Director of Putnam, Hayes & Bartlett, and before that, he was a Vice President of Charles River Associates (CRA). Before joining CRA, he was an Air Force officer assigned to the Office of the Secretary of Defense with the job title "Health Economist," and before that, he was assigned to Headquarters, USAF with the job title "Systems Analyst."

His work has included extensive research in financial economics, especially as it applies to rate regulation, project or asset valuation, and the decisions of regulated firms. Clients for this work include the California Public Utilities Commission, the Consumer Advocate in a Newfoundland proceeding, the Edison Electric Institute, the Electric Power Research Institute, the Newfoundland Federation of Municipalities, the Nova Scotia Board of Commissioners of Public Utilities, the U.S. Department of Energy, the U.S. Department of State, the Town of Labrador City, and a number of private firms, many in rate-regulated industries.

He is the coauthor of two books and has published a number of articles. He is coauthor of a report filed with the British Office of Fair Trading, in London, and he has been an expert witness in proceedings before a commercial arbitration tribunal in Australia, the International Bureau of the Permanent Court of Arbitration in The Hague, the Iran - United States Claims Tribunal in The Hague, U.S. District Courts in Colorado, New Jersey, Oklahoma and Texas, a commercial arbitration tribunal held in London concerning a dispute in Australia, and the Minerals Management Service of the U.S. Department of the Interior; in U.S. federal regulatory proceedings before the Postal Rate Commission, the U.S. Federal Communications Commission, the U.S. Federal Energy Regulatory Commission and the U.S. Federal Maritime Commission; and in state or provincial regulatory proceedings in Alaska, Arkansas, California, Maine, Massachusetts, Michigan, Montana, Newfoundland, Nova Scotia, and Virginia.

He holds a B.S. in International Affairs (Economics) from the U.S. Air Force Academy and a Ph.D. in Economics from the Massachusetts Institute of Technology.

Additional information on his qualifications follows.

HONORS AND AWARDS

Sears Foundation National Merit Scholarship, 1963 (declined).

Fairchild Award, U.S. Air Force Academy, 1968 (for standing first in his class, academically).